

The first record of the coprophilous *Coemansia erecta* in South America

MATEUS OLIVEIRA DA CRUZ &
ANDRÉ LUIZ CABRAL MONTEIRO DE AZEVEDO SANTIAGO*

*Departamento de Micologia, Universidade Federal de Pernambuco;
Av. da Engenharia, s/n, 50740-600, Recife, Pernambuco, Brazil*

* CORRESPONDENCE TO: andrelcabral@msn.com

ABSTRACT — During a survey of the coprophilous zygosporic fungal diversity in the State of Pernambuco, Brazil, *Coemansia erecta* was recovered from dung of *Cavia porcellus* (guinea pig). This is the first record of this species in South America. Images and a description of the Brazilian specimen are presented and discussed. An identification key for species of *Coemansia* from South America is provided.

KEY WORDS—*Kickxellaceae*, *Kickxellomycota*, taxonomy, zygosporic fungi

Introduction

Kickxellaceae Linder, one of the six families that belong to *Kickxellomycota* Tedersoo & al. (Tedersoo & al. 2018, Wijayawardene & al. 2022), was erected by Linder (1943) to accommodate species that form septate sporangiophores with lenticular cavities containing plugs lacking polar protuberances (Benny & al. 2001). These sporangiophores bear septate or aseptate sporocladia with pseudophialides and merosporangia (Linder 1943, Chuang & al. 2017). *Kickxellaceae* comprises *Coemansia* Tiegh. & G. Le Monn., *Dipsacomycetes* R.K. Benj., *Kickxella* Coem., *Linderina* Raper & Fennell, *Martensella* Coem., *Martensiomyces* J.A. Mey., *Mycoemilia* Kurihara & al., *Myconymphaea* Kurihara & al., *Pinnaticoemansia* Kurihara & Degawa, *Spirodactylon* R.K. Benj., and *Spiromycetes* R.K. Benj.

Coemansia, like other genera of *Kickxellaceae*, was accommodated in the hyphomycetes because of the reduced number of spores per merosporangium, in addition to the development of these merosporangia by a process of apical budding, similar to the conidial formation in some imperfect fungi. However, Linder (1943) observed morphological similarities of asexual reproductive structures of *Coemansia* spp. with those of *Syncephalastrum* J. Schröt. and *Syncephalis* Tiegh. & G. Le Monn., as well as the production of zygosporangia by *Coemansia* spp.; since then *Coemansia* has been treated as a zygosporic fungus, and the family *Kickxellaceae* was accepted (Linder 1943, Benjamin 1959).

Coemansia spp. are characterized by forming sporangiophores that are septate, erect, simple or presenting regular or irregular branches that acrogenously and laterally form sporocladia disposed by continued growth of the fertile axis arising pleurogenously (Linder 1943, Kurihara & al. 2008). Sporocladia vary among species in terms of their size and number of septa which delimit cells that support pseudophialides on their lower surfaces. Each pseudophialide produces a single sporangium that releases a single sporangiospore in a droplet of fluid when it is mature (Benjamin 1958, 1959). In some *Coemansia* species sporocladia are borne around a straight sporogenous region and in other species around a twisted sporogenous region (Chuang & Ho 2011).

Species of *Coemansia* have been isolated from dung, soil, humus, plant roots, and some specific coleopterous larvae (Linder 1943, Kwaśna & al. 1999). These species are most frequently isolated from rodent dung (Benny 2008), but they have also been isolated from the dung of rabbits and bats (Benjamin 1958), frogs (Ho & Hsu 2005), and horses, ducks, pigs, and water buffalo (Linder 1943).

Twenty-five species of *Coemansia* have been described (Wijayawardene & al. 2022), including *C. erecta*, first described by Bainier (1906) from France. A few *Coemansia* species have been recorded in South America: *C. aciculifera* Linder and *C. pectinata* (Coem.) Bainier have been reported in Argentina (GBIF 2021), while *C. aciculifera* (Mota 2011) and *C. brasiliensis* Linder (Linder 1943) have been cited in Brazil (FIG. 1A). Here we present the first record of *C. erecta* in South America, from northeastern Brazil. An illustration of this Brazilian isolate is presented, and aspects of its morphology are discussed.

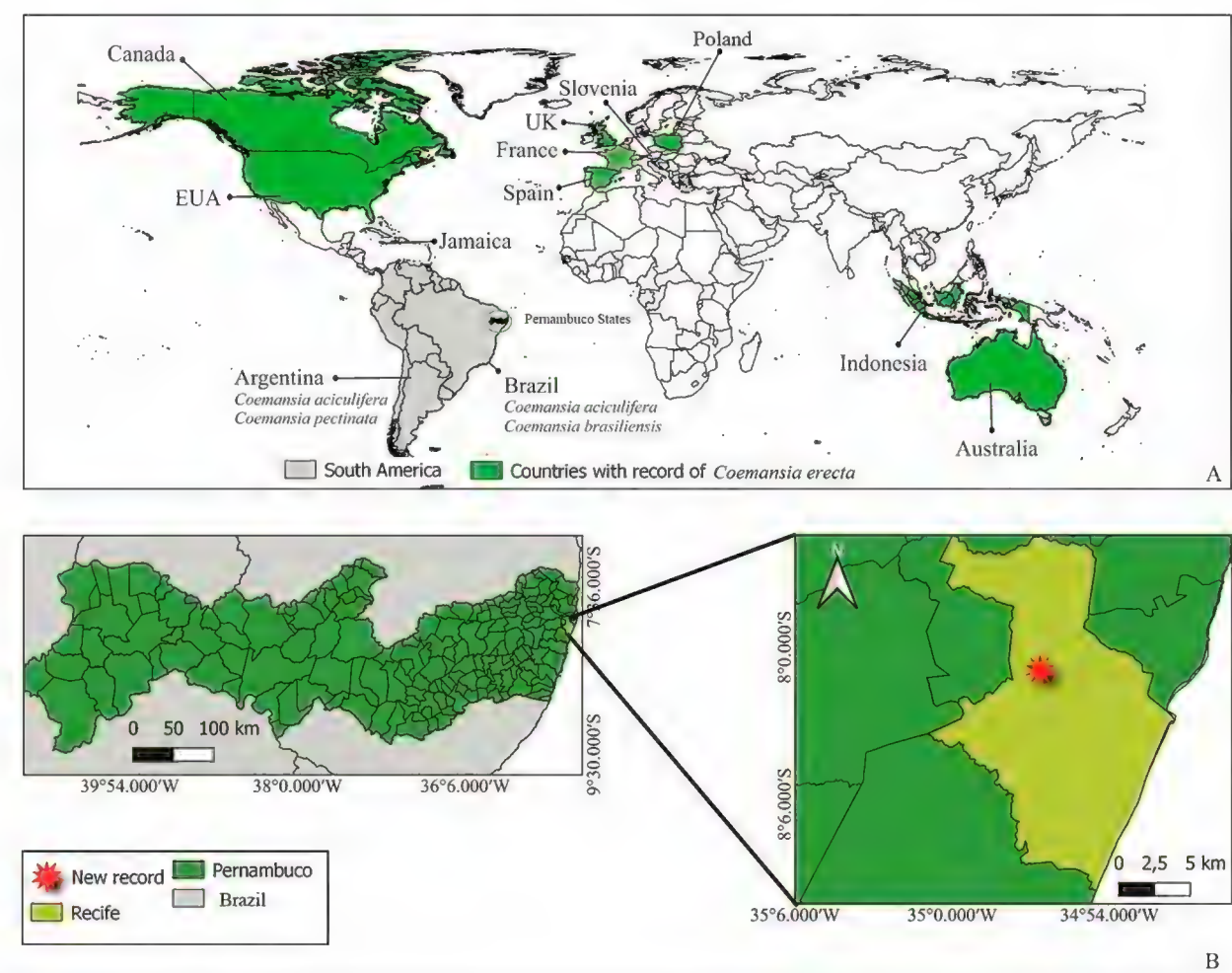


FIG. 1 *Coemansia erecta*: maps of distribution and new record: A. Worldwide distribution of *C. erecta* and current insight of *Coemansia* in South America; B. Location of *C. erecta* in State of Pernambuco, Brazil.

Materials & methods

Excrement of *Cavia porcellus* L. (guinea pig) was collected in the Parque Estadual de Dois Irmãos (8.0150°S 34.9445°W), an Ecological Reserve located in the city of Recife, state of Pernambuco, Brazil (FIG. 1B). The samples were collected with a spatula previously sterilized in 70% alcohol, placed in plastic bags, and taken to the laboratory where they were incubated in moist chambers (Petri dishes containing 2 filter paper sheets moistened with sterile distilled water) at room temperature ($\pm 28\text{ }^{\circ}\text{C}$) for 7 days (Benny 2008), in alternate periods of light and dark.

On the third day of observation, *Coemansia erecta* was observed directly on the substrate under a Leica EZ4 stereomicroscope, placed on microscope slides with 2% KOH or lactophenol blue, and observed under a Leica DM500 light microscope. Identification was based on microstructural characters following Linder (1943), Boedijn (1958), and Chuang & al. (2017). Since *C. erecta* could not be successfully grown on corn meal, MEYE, PDA, or PYED (Benny 2008) media, a permanent slide prepared directly from the moist chambers using 50% glycerol containing a small amount of Amann's cotton blue was deposited in the Herbarium, Universidade Federal de Pernambuco, Recife, Pernambuco, Brazil (URM).

Taxonomy

Coemansia erecta Bainier, Bull. Soc. Mycol. France 22: 220 (1906) FIG. 2

SPORANGIOPHORES hyaline, erect, simple, distantly septate, $450\text{--}985 \times 12\text{--}22 \mu\text{m}$, thin-walled, bifurcate or trifurcate; fertile portion of sporangiophores long, straight, producing sporocladia sympodially. SPOROCLADIAL STIPE 1-celled, thin-walled, arising at an acute angle from the axis, $4\text{--}5 \times 2\text{--}3 \mu\text{m}$. SPOROCLADIA hyaline, with 4–6 septa, excluding the stalks, smooth-walled, $15\text{--}22 \times 2.5\text{--}7 \mu\text{m}$; terminal cell hyaline, sterile, $1.5\text{--}2.5 \times 1\text{--}2.5 \mu\text{m}$, slightly recurved, coenocytic, with a rounded apex; the distance between sporocladia being $8\text{--}12 \mu\text{m}$. PSEUDOPHIALIDES hyaline, thin-walled, ovoid, formed on the lower sporocladial surfaces, two arising from each sporocladial cell, $2\text{--}3 \times 1\text{--}1.5 \mu\text{m}$. SPORANGIOLA hyaline, thin-walled, monosporic, subcylindrical with rounded apex, $10\text{--}12 \times 3\text{--}4 \mu\text{m}$. SPORANGIOSPORES subcylindrical, tapering towards the slender truncate base with rounded apex, $8\text{--}10 \times 2\text{--}3 \mu\text{m}$ ($L/W = 3.6$).

Specimen examined—BRAZIL. Pernambuco, Recife, $8.0150^{\circ}\text{S } 34.9445^{\circ}\text{W}$, dung of *Cavia porcellus* (guinea pig), 11.IV.2020, M.O. Cruz 007PEDI1 (URM 94473).

ECOLOGY & DISTRIBUTION—Dung or soil in Australia, Canada, France, Indonesia, Jamaica, Poland, Slovenia, Spain, United Kingdom, and the United States. This is the first record of *C. erecta* in South America (FIG.1).

COMMENTS—*Coemansia erecta* is mainly distinguished from other species by forming concomitantly bifurcated or trifurcated sporangiophores that do not branch dichotomously and by its subcylindrical sporangiospores showing a truncate base with a rounded apex. *Coemansia guatemalensis* Linder, which is morphologically quite similar to *C. erecta* (see Chuang & al. 2017), is distinguished by occasionally forming bifurcate (never trifurcate) sporangiophores and by its distinctly fusoid sporangiospores with $L/W = 6.8$, larger than the *C. erecta* sporangiospores ($L/W = 3.9$). The morphology of the Brazilian specimen was quite similar to those of Bainier (1906), except that the Bainier specimen produced shorter sporangiophores ($\leq 33.6 \mu\text{m}$ long). Linder (1943) described some structures as larger than those of our specimen: sporangiophores $2\text{--}4 \text{ mm} \times 7.2\text{--}14 \mu\text{m}$, sporocladial stipe $3.5\text{--}7.2 \mu\text{m}$ long, and sporocladia $20\text{--}36 \times 5.5\text{--}6.5 \mu\text{m}$. The *C. erecta* specimen described here is morphologically similar to those described by Boedijn (1958), who cited some longer structures: pseudophialides $3\text{--}5 \times 1.5\text{--}2 \mu\text{m}$, stalks $4\text{--}8 \times 3\text{--}4 \mu\text{m}$, and sporocladia $26\text{--}37 \times 4\text{--}6 \mu\text{m}$. Boedijn (1958) also reported 5–9 septa on each sporocladium, while we observed

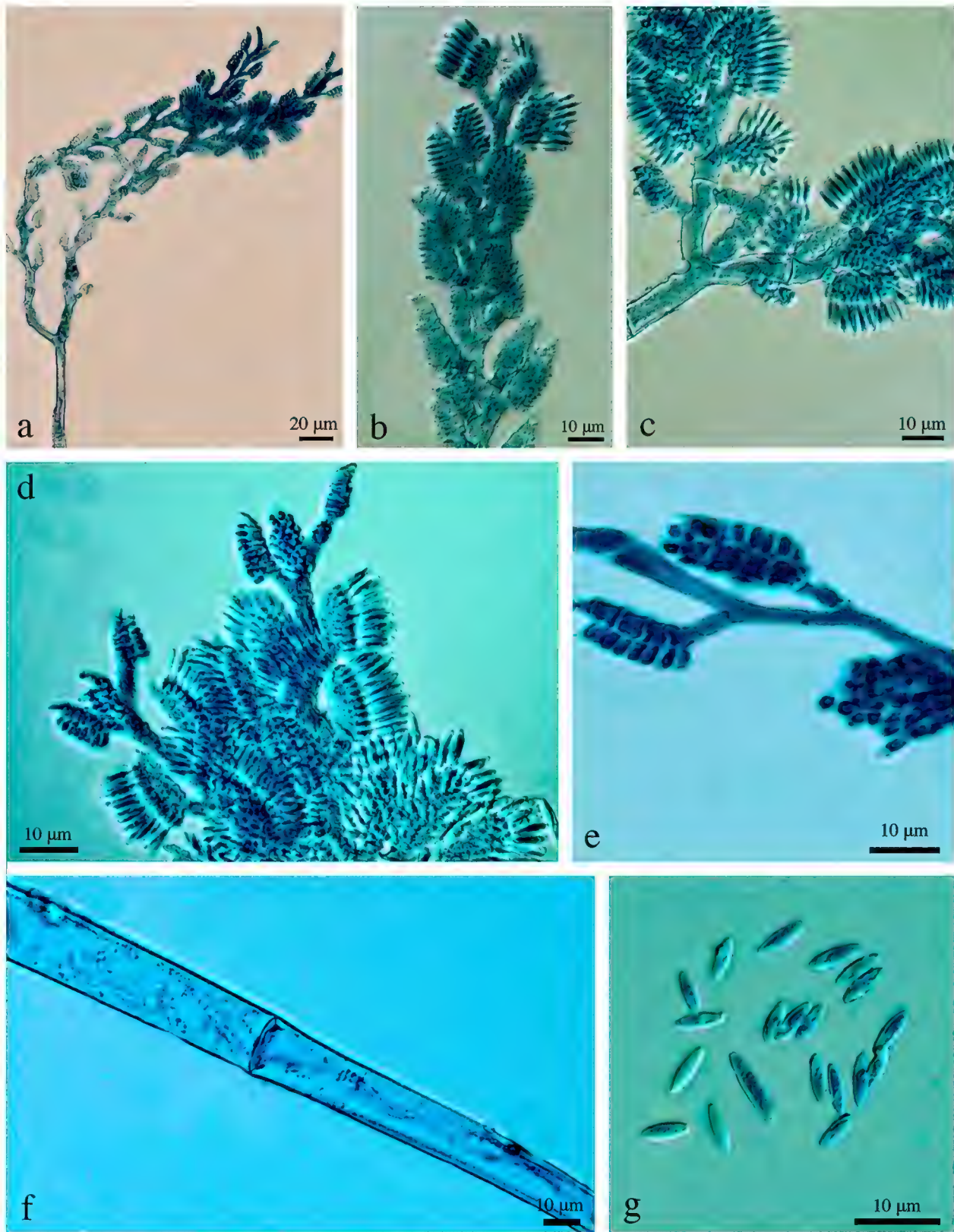


FIG. 2 *Coemansia erecta* (URM 94473): a. Fertile region of a bifurcated sporangiophore; b, d. Apical portion of sporangiophore; c. Fertile region of sporangiophore with trifurcation; e. Sporocladial stipes arising at acute angles from the axis; f. Septum with a lenticular cavity; g. Sporangiospores.

4–6 septa. It should be noted that Linder (1943) pointed out that *C. erecta* is a morphologically variable species.

Key for species of *Coemansia* from South America

1. Fertile region of the sporangiophore bifurcate or trifurcate 2
1. Fertile region of the sporangiophore simple or occasionally furcate 3
2. Sporocladia with fan-like appearance, ≤ 12 -septate *C. brasiliensis*
2. Sporocladia without fan-like appearance, ≤ 8 -septate *C. erecta*
3. Pseudophialides ellipsoidal, sporangiospores acicular *C. aciculifera*
3. Pseudophialides cylindrical, sporangiospores fusiform *C. pectinata*

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